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FEDERAL EXPENDITURES
AMONG STATES

By Professor Maw Lin Lee

Working Paper 6714
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The Allocation of Federal Expenditures Among States

By Maw Lin Lee*

This study explores factors associated with the allocation of federal expenditures by states and examines the implications of these expenditures on the state by state distribution of incomes. The allocation of federal expenditures is functionally oriented toward the objectives for which various government programs are set up. The geographical distribution of federal expenditures, therefore, was historically considered to be a problem incidental to government activity. Because of this, relatively little attention was given to the question of why some states receive more federal allocation than others.¹ In addition, the implications of this pattern of allocation among the several states have not been intensively investigated.

Federal programs vary immensely in nature. The allocation of federal expenditures to provide these programs is therefore governed by principles specific to individual programs. In spite of the diversity of federal activity, none of the programs are explicitly directed at the reduction of the inequality of incomes among states. But, in fulfilling the functions for which federal programs are provided, these expenditures undoubtedly have effects on income distribution.

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1. For a recent study, see (5).

This paper consisted of three sections. In section I, previous studies in state by state distribution of federal expenditures are briefly described. Section II is devoted to the developing and testing of hypotheses which related to factors associated with the distribution of federal expenditures by states. In section III, the implications of federal expenditures on the state by state distribution of income are examined.

I. Review of Previous Studies

The distribution of federal expenditures by states has been a topic for several studies. In her pioneer work, Illustrative Estimates of Federal Expenditures and Revenues by States, Selma Mushkin applies the concepts of benefits and incidence to estimate the distribution of federal expenditures among regions and states (2). With the cash budget of 1952, she found that the spread of per capita federal expenditures among states is narrower by use of a benefit measure than that which is obtained through an incidence measure. The dispersion of per capita expenditures among states ranged from a low of \$403 to a high of \$573 under the benefit measure in contrast with the respective limiting values of \$204 and \$780 with the incidence measure. Mushkin also found that, although per capita incidence tends to be higher in the wealthier states than in the poorer states, federal programs are relatively more important in the income flow of poorer states. Furthermore, poorer states receive the largest dollar excess of federal expenditures or benefits over revenues paid.

In contrast with Mushkin's study, Howard Schaller analyzed the effect of federal grants-in-aid on the disparity in state per capita income, using 1929, 1939, and 1949 data (3). His finding was that a tendency existed for grant-in-aid programs to reduce the disparity. He also noted that

this importance appears to be slight because the amount involved in these programs constituted only a small fraction of gross national product.

In his 1962 paper, I. M. Labovitz reported his estimate of the incidence of taxation by state of origin and the allocation of expenditures by state or recipient or activity (1). His study is based on the average of 1958, 1959, and 1960 expenditures and revenues.

As compared with the studies described above, it is not the objective of the present study to estimate the allocation of federal expenditures and sources of revenues by states. Instead, this study makes use of a set of estimated data to (1) test hypotheses about the factors associated with the distribution of federal expenditures by states, and (2) evaluate the income distribution effects of these expenditures.

II. Factors Affecting the Allocation of Federal Expenditures Among States

In attempting to find a general principle which governs the allocation of federal expenditures among states, objectives and functions of various federal programs are examined. The objectives and functions of federal programs are many. But these can be generalized as (1) to provide a remedy for problems arising from social and economic development; (2) to foster or encourage the expansion of certain basic social services or maintain a certain minimum of these services; and (3) to procure goods and services for government.

By the implications of the objectives and functions of federal expenditures generalized above, the extent to which a state will receive

federal expenditures depends on the nature and magnitude of its social and economic problems; the need of a state to expand the basic social services and its ability to finance this expansion; and the ability and efficiency of a state's economy to supply the kind of goods and services demanded by federal government.

The nature and magnitude of a state's economic and social problems are characterized by the nature and extent of its industrialization and urbanization. For a state in an early stage of industrialization and urbanization, social overhead facilities have to be developed to make conditions conducive to economic development. In a state where industries have long matured and populations are concentrated in urban areas, problems posed by mature industrialized and urbanized society are in urgent need of remedy. The demand for funds to deal with social and economic problems therefore exists in both industrializing and urbanizing as well as industrialized and urbanized states. However, the nature of social and economic problems faced by states with different extents of industrialization and urbanization is different. In addition, there also exist differences in the financial ability of states to provide or maintain the necessary social services. It is therefore reasonable to expect that the nature and magnitude of the demand for federal resources differ from one state to another.

With respect to the ability and efficiency of a state's economy to supply the kind of goods and services demanded by the federal government, it will be pointed out that a major portion of federal expenditures is for defense and NASA procurement which have a very high technological content. On the assumption that efficiency is the most relevant consideration, industrialized and urbanized states may be expected to receive a large part of federal expenditures for these purposes.

In formulating an economic model for statistical analysis, the allocation of federal expenditures is assumed to be a function of the level of income, the extent of industrialization, and the extent of urbanization. Recent changes in the extent of industrialization and urbanization are differentiated from early industrialization and urbanization to distinguish the nature and magnitude of social and economic problems. The following equation is statistically estimated:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_2 + b_4X_3 + b_5X_3 + u \quad (1)$$

where

Y : per capita federal expenditures by states in dollars.

X_1 : per capita disposal income in hundreds of dollars.

X_2 : Manufacturing employment as a percentage of total employment in 1940.

ΔX_2 : Change in manufacturing employment as a percentage of total employment between 1940 and 1960.

X_3 : Urban population as a percentage of total population in 1940.

ΔX_3 : Change in urban population as a percentage of total population between 1940 and 1960.

Data: The data used in this study are from a tabulation on 'Distribution of Allocated Federal Expenditures Within the States,' supplied by the Subcommittee on Intergovernmental Relations of the U.S. Senate Committee on Government Operations. The data covered 1957, 1960, and 1963. These data were published while the present study was underway (4).

The estimated allocation of federal expenditures covers seven major categories as well as total Federal expenditures. These are: (1) military reserves and civil works, (2) defense research and development, (3) defense and NASA procurement, (4) transfer payments, (5) civil and military salaries, (6) aid to individuals, and (7) aid to states and localities.

The statistical estimates² of Equation (1) for the total allocation and major types of federal expenditures are presented in Table I. The proportion of variance explained in these equations ranges from .486 for "aid to states and localities" to .129 for "defense, research and development." The wide variation in the R²'s indicated that the explanatory variables selected to represent the hypotheses postulated in this study are more appropriate in explaining the distribution of certain types of expenditures than of others.

A. Total Allocation

Table I indicates that the allocation of federal expenditures as a whole is positively correlated with disposable income, but negatively correlated with the degree of industrialization and urbanization as well as the recent changes in the extent of industrialization and urbanization. These results suggest that states with high per capita disposable income receive more federal expenditures than states with low per capita income. The per capita federal expenditures allocated to industrialized and urbanized states, however, are relatively smaller than those which are allocated to less industrialized and urbanized states.

Total allocation of federal expenditures is an aggregative measure which comprises many types of federal programs. Since each of these programs is governed by principles specific to its objective, it is not surprising that the equations explaining the allocation of specific

2. The results shown in this study are estimated from the combined observed data for 1957, 1960, and 1963. This pooling of observations yields a weighted average of the relationship for the three individual years considered. The decision to combine the observations was made: (1) with a view to reduce influences of factors peculiar to any individual year; and (2) because a preliminary investigation reveals that the relationship estimated for individual years exhibits only small differences.

Table I. Regression of Geographic Allocation of Federal Expenditures on Selected Economic Characteristics of States

	<u>Constant</u>	<u>X₁</u>	<u>X₂</u>	<u>ΔX₂</u>	<u>X₃</u>	<u>ΔX₃</u>	<u>R²</u>	<u>S_e</u>
Allocation of Total Expenditures	75.98	29.52 (3.40)	-7.60 (1.95)	-5.14 (4.61)	-1.46 (1.34)	-1.70 (2.18)	.387	172.05
Military Reserves Civil Works	41.69	.19 (.20)	-.41 (.10)	-.74 (.23)	-.32 (.07)	-.54 (.11)	.329	8.70
Defense Research and Development	-43.99	.24 (1.32)	-.66 (.64)	.51 (1.52)	1.42 (.44)	.18 (.72)	.129	56.70
Defense and NASA Procurement	-160.78	9.72 (1.34)	.84 (.66)	.67 (1.55)	.26 (.45)	2.12 (.74)	.417	57.85
Transfer Payments	65.53	2.54 (.59)	.11 (.29)	-.50 (.68)	-.13 (.20)	-.93 (.32)	.301	25.46
Civilian Military Salaries	106.64	12.26 (3.19)	-6.11 (1.56)	-3.33 (3.67)	-1.08 (1.07)	-2.50 (1.74)	.211	137.06
Aid to Individuals	40.65	-1.56 (1.65)	-.75 (.08)	-.99 (.19)	-.05 (.06)	-.44 (.09)	.456	7.10
Aid to States and Localities	55.01	3.67 (.52)	-.98 (.25)	-1.92 (.60)	-1.15 (.18)	-.36 (.28)	.486	22.50

types of federal expenditures differ widely in terms of the sign, magnitude, and significance of estimated coefficients.

B. Military Reserve and Civil Works

In contrast to the high positive correlation between total allocation of federal expenditures and disposable income, federal expenditures on military reserves and civil works are not correlated with disposable income. However, the extent of industrialization and urbanization have a very high negative effect on this category of federal expenditures. A major portion of this category of allocation represents civil works expenditures for conservation and construction projects of the U.S. Army Corps of Engineers. Because of the nature of the functions of the Army Corps of Engineers, most of the conservation and construction works is confined to relatively undeveloped areas of the country. It is therefore reasonable to expect that the industrialized and urbanized states receive smaller amounts of these expenditures than states which are not so industrialized and urbanized.

C. Defense Research and Development

This category of expenditures is highly technologically oriented. Thus, contract awards for these services are very selective. In the equation explaining the allocation of defense research and development expenditures, the coefficients for income and industrialization are not statistically significant. The estimated results indicate, however, that the more urbanized a state is, the larger the amount of defense research and development it receives.

D. Defense and NASA Procurement

Defense and NASA procurement differ from defense research and development because the former represents a demand for products and the

latter is a demand for services.³ The impact of these expenditures is therefore different. That is, we may expect the prime contractors for defense and NASA procurement to be more dependent on other suppliers than those for defense research and development. The incidence of defense research and development expenditures therefore is more likely to remain within the original recipient states than that of defense and NASA procurements.

In the equation explaining the allocation of defense and NASA procurement expenditures, the coefficients of income, industrialization, and urbanization are all positive. Some of these statistics are not significant. But the fact that these coefficients are distinctively different from the negative coefficients for the corresponding variables in other equations implies that the nature of defense and NASA procurement is quite different from that of other types of expenditures. The positive sign of the statistics indicates that high income, industrialized and urbanized states receive a larger amount of defense and NASA procurement than states which have relatively lower levels of income, industrialization and urbanization: a result consistent with the argument that industrialized and urbanized states have the capacity to supply the kinds of products required by defense and NASA procurement.

E. Transfer Payments

Federal transfer payments include the payments of benefits for Old Age Survivors and Disability Insurance, railroad retirement and unemployment benefits, payments to non-profit organizations, veterans'

3. An exception to this statement should be noted. That is, a substantial part of NASA expenditures goes for research and development.

pensions and compensation, military retirement benefits, federal unemployment insurance payments (exclusive of benefits paid under state and local programs for the unemployed), and other aid to individuals and others (such as fellowships and research grants). Because of the particular nature of these programs, Federal transfer payments affect selected groups of the population.

In the statistical results, the state by state distribution of transfer payments is positively correlated with the level of disposable income but negatively related to recent change in the extent of urbanization. This negative coefficient for recent change in the extent of urbanization is evidence that characteristics of population in newly urbanized area are different from the characteristics of the beneficiaries of federal transfer payments described above.

F. Civilian and Military Salaries

Civilian and military wages and salaries considered here are the earned personal incomes of the employees of the Federal government. Here wage and salary expenditures are distributed according to the location of federal civilian employees and of defense establishments. The estimated results of this study indicate that not only the salary structure of federal employees is different from the income structure of the general population, but the geographical distribution of federal civilian and military employment is also not proportionate to the location of economic activity and population.

G. Aid to Individuals

This category of expenditure constitutes direct federal aid payments to individuals and others under such programs as the Department of

Agriculture conservation and subsidy activities, Department of Commerce grants to maritime schools for cadets' subsistence, army and air civil national guard and civil defense, the Department of Health, Education and Welfare, etc. The statistical results in Table I indicate that the allocation of federal aid to individuals and others is inversely related to income, industrialization, and urbanization. It is interesting to note that the coefficients for recent changes in the extent of industrialization and urbanization have a higher level of statistical significance than the corresponding coefficients for early industrialization and urbanization. Again the difference in economic and demographic characteristics of newly industrialized and urbanized states from that of mature industrialized and urbanized states may explain these results.

H. Aid to States and Localities

The principal part of federal aid to states and localities takes the form of grants-in-aid which are provided for the purpose of fostering or maintaining certain social overhead services. This category of expenditures is often dependent on a state's financial ability to match these grants, which in turn is a function of economic and demographic characteristics of the state. This consideration is consistent with the statistical results indicating that federal aid to states and localities is positively correlated with income and negatively related to industrialization and urbanization.

III. Implications of Federal Expenditures on State By State Income Distribution

The empirical results examined in the previous section show that there is a positive correlation between disposable income and all

types of federal expenditures with the exception of "aid to individuals." Superficially, this result appears to indicate that high income states receive more federal expenditures than low income states and that federal allocation has aggravating effects on the inequality of income among states. But this assertion must be qualified.

In order to be able to draw any inference about the distribution effect of federal allocation, a number of factors has to be brought into consideration. First, an analysis of the impact of federal allocation on income distribution requires explicit account of the contribution of each state to federal revenue collections to arrive at an estimation of net effects of federal tax collection and expenditure. Since no data on the incidence of federal taxation by states are available, this study makes use of federal revenue collections in each state as a first approximation to its tax contribution.⁴ The data used in this study are obtained from the Annual Report of the Director of the Internal Revenue Service for 1957, 1960, and 1963.

Second, an evaluation of the implications of federal expenditures and taxation on the distribution of income by states requires an account of how such expenditures and taxation are functionally related to the structure of family and personal income. However, empirical knowledge about these relationships is not available. This analysis is therefore conducted on the assumption that federal expenditures and taxation affect residents of a state uniformly.

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4. It would be of interest to indicate briefly the relationship between federal expenditures and revenues. A scatter diagram relating these two variables does not indicate any systematic pattern of relationship in an ordinary sense. But a closer examination reveals that among the states that have per capita revenues of less than \$350, the per capita expenditures exceeded that of revenues. On the other hand, among the states with per capita revenues of \$520 or more, expenditures were less than revenues in all cases. Several states with tax contribution of between \$350 and \$520 have expenditures in excess of revenues, but most of other states in this category pay more taxes than the amount of expenditures they receive.

Third, the incidence of the state-by-state allocation of federal expenditures does not fall entirely in a state where expenditures are initially made. Some of the expenditures find their way out of the state.

If the total allocation for a given state i is Y_i , and the amount of outflow (or leakage) from state i to state j is $k_{ij}Y_i$, where k_{ij} is a positive constant representing the proportion of federal allocation to state i which leaks to state j , then the total leakage of state i is

therefore $\sum_{j=1}^{50} k_{ij}Y_i$ (for $i \neq j$). State i , however, also receives expenditures that flow out of another state j , in the amount of $k_{ji}Y_j$.

The total amount of inflow which state i receives from all others is

$\sum_{j=1}^{50} k_{ji}Y_j$ (for $i \neq j$).

The net incidence of federal allocation for state i is therefore

$$Y_i - \sum_{j=1}^{50} k_{ij}Y_i + \sum_{j=1}^{50} k_{ji}Y_j$$

It should be noted that k_{ij} is a function not only of the type or nature of federal allocation but also of the characteristics of economic and social as well as other conditions relating states i and j . No data, however, are available to estimate k_{ij} . This study therefore is undertaken on the assumption⁵ that

$$\sum_{j=1}^{50} k_{ij}Y_i + \sum_{j=1}^{50} k_{ji}Y_j = 0$$

Assuming that federal expenditures and tax collections are respectively related to income as

$$Y = A_0 + A_1X_1 + u \quad (2)$$

$$Z = C_0 + C_1X_1 + v \quad (3)$$

5. This assumption is probably quite realistic for such federal expenditures as aid to individuals and transfer payments, but unrealistic for defense and NASA procurement.

where Y is federal per capita allocation, X_1 is per capita disposable income, and Z is per capita federal tax collections. It is assumed that federal expenditures represent an addition to, while tax collections represent deletion from, the income of a state. The net effect of federal allocation of expenditures is therefore

$$Y - Z = (A_0 - C_0) + (A_1 - C_1) X_1 + (U - V) \quad (4)$$

Estimates of Equations (2), (3) and (4) for total federal expenditure allocation and tax collection are as follows:

$$Y = -31.32 + 22.394X_1 \quad R^2 = .241 \quad S_e = 188.93 \\ (3.270)$$

$$Z = -433.50 + 39.968X_1 \quad R^2 = .426 \quad S_e = 220.35 \\ (3.814)$$

$$Y-Z = 402.18 - 17.574X_1 \quad R^2 = .055 \quad S_e = 346.68 \\ (6.001)$$

The above results indicate that both federal expenditure allocation and tax collection are positively correlated with per capita income. However, the magnitude of positive coefficients in the regression of tax collection on disposable income is greater than that in the regression of allocation on income. The relation of the difference between allocation and tax collection ($Y-Z$) to income is therefore negative. This negative relationship implies that federal expenditures and tax collection as a whole have a net equalizing effect on the distribution of incomes among states.

The total allocation by states, considered above, represents an aggregation of federal expenditures which are highly diversified in nature. Because of the difference in nature and objectives, certain types of federal allocation may be expected to have greater equalizing effects on income distribution than the others. The implications on

the distribution of income for each type of federal expenditures are therefore investigated individually. A study of this nature, however, requires data on the amount of each state's contribution to specific type of federal programs. Since no such data are available, an estimate of this amount is made under the following assumption: the amount which a state contributes to a particular program is proportional to the allocation of the total federal expenditures for the program. In the years, 1957, 1960, and 1963, the total federal expenditures were allocated for various programs in the proportion shown in Table II.

Table II. Distribution of Federal Expenditures

by Programs

<u>Types of Programs</u>	<u>1957</u>	<u>1960</u>	<u>1963</u>
Military Reserve and Civil Works	.0202	.0206	.0194
Defense Research and Development	.0512	.0680	.0599
Defense & NASA Procurement	.3083	.2799	.3011
Transfer Payments	.2215	.2506	.2612
Civil and Military Salaries	.3120	.2744	.2539
Aid to Individuals	.0204	.0156	.0166
Aid to States and Localities	.0666	.0909	.0880
Total	1.0000	1.0000	1.0000

Table II shows that of each dollar of tax contribution made by a given state in 1957, 2.02 cents went to military reserve and civil works, 5.12 cents went to defense research and development, 30.83 cents went to defense and NASA procurement, 22.15 cents went as transfer payments, etc. The amount a state contributes to each type of program is given by the product of the proportion shown in Table II and the amount of taxes which the state pays during the particular year.

The linear regressions relating various types of expenditures and disposable income are shown in the second column of Table III. The

Table III Regression of Federal Allocation on
Disposable Income

Type of Allocation (I)	Allocation II	Estimated Tax Contribution III	Allocation-Tax Contribution IV
Military Reserve and Civil Works	$20.77 - .411 X_1$ (.178)	$R^2=.035$ $-8.45 + .788 X_1$ (.077)	$29.22 - 1.199 X_1$ (.203) $R^2=.191$
Defense Research and Development	$-42.51 + 3.009 X_1$ (1.007)	$R^2=.057$ $-27.40 + 2.466 X_1$ (.232)	$-15.11 + .544 X_1$ (1.039) $R^2=.002$
Defense and NASA Procurement	$-99.28 + 9.730 X_1$ (1.017)	$R^2=.382$ $-126.00 + 11.690 X_1$ (1.149)	$26.72 - 1.960 X_1$ (1.703) $R^2=.009$
Transfer payments	$37.40 + 2.952 X_1$ (.460)	$R^2=.218$ $-115.03 + 10.259 X_1$ (.935)	$152.43 - 7.308 X_1$ (1.071) $R^2=.239$
Civilian Military Salaries	$-.10 + 7.075 X_1$ (2.570)	$R^2=.049$ $-106.13 + 10.424 X_1$ (1.101)	$106.03 - 3.350 X_1$ (3.086) $R^2=.008$
Aid to Individuals	$17.44 - .320 X_1$ (.162)	$R^2=.026$ $-6.46 + .659 X_1$ (.076)	$23.90 - .980 X_1$ (.192) $R^2=.149$
Aid to States and Localities	$28.72 + .838 X_1$ (.532)	$R^2=.017$ $-40.50 + 3.528 X_1$ (.319)	$69.21 - 2.690 X_1$ (.693) $R^2=.092$

results indicate that only two types of expenditures--military reserves and civil works, and aid to individuals--are negatively related to income. This result may be interpreted as an evidence that these two types of federal allocation have equalizing effects on income distribution regardless of the effect of taxation. The positive coefficients in the equations relating defense research and development, and defense and NASA procurement, transfer payments, and civilian and military salaries to disposable income indicate that high income states receive a larger amount of these allocations.

The relation of net federal allocations (after deducting the effect of tax contributions) to disposable income is shown in the right hand column of Table III. The regression coefficients in these equations have a negative sign in all but one case. The negative coefficients, however, are statistically significant only in the regression of military reserves and civil works, transfer payments, aid to individuals, and aid to states and localities. Federal programs provided in these categories are either welfare or service oriented and the evidence that these expenditures have a net equalizing effect on income distribution seems quite logical. The coefficients in the regressions of defense research and development, defense and NASA procurement, and civilian and military salaries on disposable income are not significantly different from zero. Defense research and development, and defense and NASA procurement are efficiency oriented, but the statistical results indicate that income distribution effects of these programs are neutral. The evidence that federal defense research and development, and defense and NASA procurement do not have aggravating effects on income distribution is contradictory to the expectation of the man on the street. It should

be noted, however, that although high income states receive a larger amount of federal defense research and development as well as defense and NASA procurement, these states also contribute larger amounts toward federal tax revenue collection. The net effect is therefore neutral.

IV. Summary

The analysis of factors affecting the allocation of federal expenditures by states was based on an economic model developed under a set of general hypotheses. It is apparent from the analysis in Section II that a specific model, based on particular hypotheses about the principle governing the distribution of each type of federal expenditures, has to be developed. This is a task currently being undertaken.

The evidence on the implications of federal programs for state by state income distribution should be considered as preliminary. More definite conclusions cannot be obtained until more comprehensive and refined data become available.

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